THE LEGACY OF THE MISSING MEN
The Long-Run Impact of World War I on Female Labor Participation

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Abstract

I explore the long-run impact of World War I military fatalities on female labor participation at the individual level. Combining all the French census microdata and annual labor surveys, I find that women whose lineage was exposed to higher military death rates were more likely to be in the labor force up until today. This lineage-based aspect accounts for about half of the overall impact of the war, suggesting an important role of individuals relative to local institutional structures in generating persistence of historical shocks. I then trace the diffusion pathways of this historical shock and uncover three mechanisms of historical persistence: horizontal transmission through the marriage market—from husbands to wives—, vertical intergenerational transmission—from parents to daughters—, and oblique intergenerational transmission—from migrants to non-migrants. Among all the mechanisms examined, the intergenerational transmission from mothers to daughters’ working behavior and cultural beliefs appears the strongest.

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I. Introduction

History shapes current economic outcomes. From the timing of the Neolithic revolution to the implantation of colonial institutions, a wide range of historical events exhibit considerable persistence in their impact on modern societies (Spolaore and Wacziarg 2013, Nunn 2014, Michalopoulos and Papaioannou 2017). Less clear are the mechanisms underlying such historical persistence. With a methodological focus on a location-based aspect of history—how historical events in a given location shape long-run outcomes in that location—, several channels of persistence have been explored: path dependence, domestic institutions, culture (Nunn 2014). However, as a result of this methodological tendency, a crucial linkage of historical persistence has received much less attention: individuals.

Indeed, uncovering how individuals transmit the legacies of history across generations independent from confounding institutional structures requires extracting from a location-based approach to history and shifting toward a lineage-based approach to history (Michalopoulos, Putterman and Weil 2016). This lineage-based approach is best characterized by an empirical strategy akin to the epidemiological approach to culture: the analysis of variations in the behavior of individuals evolving within in the same institutional environment, but whose lineage was differentially exposed to a particular historical event (Fernández 2011). Only recently have researchers begun to explore this lineage aspect, showing for instance that the behavior and beliefs hold by individuals today are dependent upon the exposure of their ancestors to the intensity of the slave trade (Nunn and Wantchekon 2011), to the sexual division of labor in ancestral forms of agriculture (Alesina, Giuliano and Nunn 2013), or to pastoralist and agriculturalist ancestral lifeways (Michalopoulos et al. 2016).\footnote{One reason for this general focus on a location-based approach to history is that “it is relatively easier to map the locations of historical events to modern-day territories” (Michalopoulos et al. 2016, p. 1). Another is the relative availability of aggregate-level data compared to individual-level data, especially regarding individuals’ geographical origins.}

Going beyond such reduced-form evidence and investigating mechanisms of historical persistence at the individual level is, however, difficult. Outcomes are usually observed at one point in time, long after the historical event under scrutiny. Moreover, treatment usually consists of differences in ancestral conditions across locations. Both make it challenging to identify the diffusion dynamics at play in the persistence of historical events.

In this paper, I trace the long-run diffusion pathways of a severe exogenous shock to the adult sex ratio on female labor participation: military fatalities from World War I (WWI) in France. I focus on a lineage-based aspect of history and explore how individuals transmitted the legacy of the missing men across generations independent from their impact on institu-
tional structures. I provide empirical evidence for three mechanisms of historical persistence at the individual level: horizontal transmission through the marriage market—from husbands to wives—, vertical intergenerational transmission—from parents to daughters—, and oblique intergenerational transmission—from migrants to non-migrants. These individual-level channels help explain about half of the overall persistence of WWI military fatalities on female labor participation.

While WWI ravaged continental Europe between 1914 and 1918, France suffered an especially high death toll relative to other belligerent countries. Because of a universal conscription system, most French male citizens were drafted throughout the war: out of a population of 10 million men aged 15 to 50 before the war, 8 million were drafted in the army. 1.3 million of them died in combat; a military death rate of 16%. As a result, the adult sex ratio dropped from 98 men for every 100 women at the onset the war to 88 men for every 100 women by the end of the war. It was not until after World War II (WWII) that the pre-WWI adult sex ratio was restored (see Figure 1). This sharp shock induced many women to enter the labor force: in départements exposed to military death rates of 20% rather than 10%—equivalent to switching from the 25th to the 75th percentile of the distribution—female labor participation was 4 percentage points higher throughout the interwar period (Boehnke and Gay 2017). This corresponds to an increase of 12% in female labor participation compared to pre-war levels.

I first explore whether this upward shift in female labor participation during the interwar period perpetuated across generations. To analyze the reduced-form impact of WWI military fatalities on women’s working behavior in the long run, I combine all the French censuses for which microdata are available—the thirteen censuses between 1962 and 2012. Then, to uncover the individual-level legacy of the missing men rather than their location-level legacy, I use an empirical strategy that mirrors the epidemiological approach to culture (Fernández 2011). With this empirical strategy, identification stems from variations in the working behavior of women born in départements that were exposed to varying levels of military death rates, but living within the same département, thereby facing similar institutional constraints when making decisions. I find that women born in départements exposed to high military death rates (20%) rather than to low military death rates (10%) were 5 percentage points more likely to be working between 1962 and 2012—this represents from 15% of the average female labor participation rate in 1962 to 5% in 2012. Regression coefficients are precisely

2French départements are one of the three levels of government below the national level. There were 87 départements before the war, and 90 after the war. The three new départements belonged to Germany before the war. The interwar period is the period between the end of WWI (1918) and the beginning of WWII (1939 in France).
Figure 1 notes: This figure presents the adult sex ratio for the age group 15 to 50. Yearly data between 1900 and 2014. The first vertical rays (1914-1918) indicate WWI. The second vertical rays (1939-1945) indicate WWII. See appendix C for details about variable sources and definitions.

estimated and stable throughout the period. I show that this lineage-based aspect accounts for about half of the overall impact of WWI military fatalities, suggesting an important role of individuals relative to local institutional structures in generating persistence of historical shocks.

Because the identification relies on the working behavior of internal migrants within France—about half of the French population—, I provide a series of robustness checks showing that selective in- and out-migration patterns do not drive the results. For instance, using a rich set of residence location fixed effects, I show that the results are identical when comparing women living within the same département, within the same local labor market, or within the same municipality. I also find that fertility and education choices do not mediate the correlation between WWI military fatalities and female labor participation. The results are robust to a replication using the combination of all thirty-two annual labor surveys between 1982 and 2013.³

I then explore the mechanisms underlying such historical persistence. I argue that women induced to enter the labor force in the interwar period because of WWI military fatalities altered the preferences and beliefs about gender roles of their sons, of their daughters, and of their entourage, and that this translated into the working behavior of women in later

³Only after 1982 do the labor surveys provide both respondents’ départements of residence and départements of birth, thereby allowing the use of the epidemiological approach.
generations. Because individuals form their preferences and beliefs upon learning and socializing with their parents and their peers (Bisin and Verdier 2001, 2011, Fernández 2013, Olivetti, Patacchini and Zenou 2017), men who grew up with a working mother should form more progressive views about gender roles, making them less averse to marry a working woman (Fernández, Fogli and Olivetti 2004).\footnote{Alternatively, Fernández et al. (2004) make the point that those men could have similar preferences but greater household productivity, which would in turn enable their wives to dedicate more time to market production rather than household production.}

Similarly, women who grew up with a working mother—or in an environment in which many women worked—should also form more progressive views about gender roles, making them more likely to work when adults. Indeed, many studies find a strong correlation between the working behavior of mothers and daughters, mothers in-law and daughters in-law, and mothers and their daughters’ peers.\footnote{The transmission channel from mothers in-law’s labor choices to their daughters in-law’s has been empirically verified for the U.S. (Morrill and Morrill 2013) and for other countries (Kawaguchi and Miyazaki 2009, Büttikofer 2013). Further, Farre and Vella (2013) show that the attitudes of mothers in the U.S. toward gender roles and their working behavior is correlated with their own daughters’ attitudes when young as well as their working behavior when adults. This phenomenon has also been empirically established in Great Britain (Johnston, Schurer and Shields 2014) and in Mexico (Campos-Vazquez and Velez-Grajales 2014). Finally, Olivetti et al. (2017) show that the working behavior of the mothers of a woman’s friends when growing up affects her own working behavior later in life.}

I uncover three mechanisms underlying the historical persistence of the impact of WWI military fatalities on women’s working behavior: horizontal transmission through the marriage market, vertical intergenerational transmission, and oblique intergenerational transmission. Matching wives and husbands in the censuses between 1962 and 2012, I show that the exposure of husbands’ départements of birth to WWI military fatalities is correlated with the working behavior of their wives: when comparing women born and residing within the same département, those whose husbands were born in départements exposed to high military death rates (20%) rather than to low military death rates (10%) were 2 to 5 percentage points more likely to be working. To identify vertical intergenerational transmission from parents to children, I combine the extended version of the annual labor surveys between 2005 and 2012, which contain the départements of birth of respondents’ parents. This allows me to focus on the sample of second-generation internal migrants and to compare non-migrant women whose parents migrated from départements exposed to varying levels of military death rates. I find strong evidence for the persistence of the legacy of the missing men through women’s mothers, and, to a lesser extent, through their fathers as well: while second-generation internal migrant women with mothers born in départements that were exposed to high military death rates (20%) rather than to low military death rates (10%)
were 13 percentage points more likely to be working, those with fathers born in départements exposed to high rather than to low military death rates were 7 percentage points more likely to be working. I also find that women’s mothers in-law participated in the transmission of the shock, although the evidence is less conclusive than for own parents. I then explore the role of oblique intergenerational transmission and analyze whether migrant women diffused the legacy of the missing men to non-migrant women in their destination département. I find that the exposure to WWI military fatalities among immigrants’ origin départements contributed to change the working behavior of later generations of women in their destination départements.

Finally, I explore whether changes in norms in the working behavior of mothers induced by WWI military fatalities were at the roots of this historical persistence. Using the sample of second-generation internal migrants in the extended version of the labor surveys between 2005 and 2012 together with a 2SLS strategy, I find conclusive evidence of a strong pass-through from the war-induced changes in mothers’ working behavior to their daughters’ working behavior. Further, I use the French component of the Generation and Gender Survey (GSS) of 2005, the ERFI dataset (Study of Family and Interregional Relationships) to investigate directly the legacy of the war on cultural beliefs about gender roles. Using again the epidemiological approach, I find that women born in départements exposed to higher levels of military death rates are more likely to hold progressive cultural beliefs related to the role of women in the labor force. I further show that this phenomenon was not mediated by education, fertility, or working decisions. Rather, a quarter of the legacy of the war on women’s cultural beliefs was mediated by its impact on the working behavior of their mothers.

In the reminder of the paper, I first describe the extent of WWI military fatalities and how they generated an upward shift in female labor participation in the interwar period (section II). I then show that this upward shift perpetuated across generations at the individual level (section III). Then, I uncover three mechanisms through which the legacy of the missing men persisted (section IV): horizontal transmission through the marriage market, vertical intergenerational transmission, and oblique intergenerational transmission. Finally, I show that part of this persistence is due to changes in the working behavior of mothers induced by WWI military fatalities as well as changes in cultural beliefs about gender roles (section V).
II. WWI and Female Labor Participation in the Interwar Period

A. WWI Military Fatalities

A.1. Measuring Military Death Rates

To build a precise measure of military death rates at the département level, I collected the individual military records of all 1.3 million French soldiers who died because of the war, and I extracted their dates of birth as well as their départements of birth.\(^6\) The military death rate in a département is then defined as the ratio of the number of deceased soldiers born in the département to the size of its drafted population. Because, at the onset of the war, the organization of the army relied on an egalitarian and universal conscription system for all French male citizens aged 20 to 48, the size of the drafted population in a département is captured by its male population aged 15 to 44 in the census of 1911—the last census before the war.\(^7\) Figure 2 displays the distribution of military death rates across 87 départements. Military death rates range from 6% in Belfort to 29% in Lozère, with an average of 14% and a standard deviation of 4%.

Military fatalities had a dramatic impact on adult sex ratios. Table 1 reports the coefficients from estimating the following first-difference specification across various age groups:

\[
\Delta \text{sex ratio}_{a,d} = \alpha + \beta \text{death rate}_d + \varepsilon_{a,d},
\]

where \(\Delta \text{sex ratio}_{a,d}\) denotes the change between 1911 and 1921 in the sex ratio of age group \(a\) in département \(d\). Because drafted men were 20 to 48 during the war, these age groups experienced the strongest declines in sex ratios. For instance, a 10 percentage points

\(^6\) These individual military records are available on the \textit{Mémoire des Hommes} (MDH) archive, which is maintained by the French Ministry of Defense. This dataset is also used in Boehnke and Gay (2017). Parts of section II are from Boehnke and Gay (2017). The original archive is accessible at \url{http://www.memoiredeshommes.sga.defense.gouv.fr}. See appendix C for more details on this database. The exact number of soldiers who ultimately died as a direct consequence of the war is not known with certainty as some soldiers died a few years after the war because of injuries or illnesses contracted during the conflict. However, the figure of 1.3 million is the consensus among historians. Prost (2008) and Beau (2017) provide a detailed account of the assessment of WWI military fatalities. It is similarly difficult to assess the number of civilian victims during the conflict. When adding up the number of pension requests resulting from civilian fatalities, the number of victims during the bombing of cities near the front—Dunkerque, Calais, Béthunes, Arras, Lens, Reims, Pont-à-Mousson, and Nancy—and Paris, as well as the civilian victims of the commercial fleet, they amount to about 40,000 (Huber 1931, pp. 310–314).

\(^7\) The relevant conscription law during World War I can be found in the \textit{Journal Officiel de la République Française, Lois et Décrets, 35} (81), pp. 1869–1890, dated March 23rd, 1905. Boehnke and Gay (2017) show that this measure is only marginally affected by pre-war internal migration flows and differential pre-war health conditions across départements.
Figure 2 notes: The data are missing for the three départements that belonged to Germany before WWI—Bas-Rhin, Haut-Rhin, and Moselle. Shaded areas indicates the départements in which war combats occurred. The composition of each military region is from the *Journal Officiel de la République Française, Lois et Décrets, 45* (261), pp. 8546–8547, dated September 26th, 1913.

An increase in military death rates was associated with a 3 to 6 percentage points decline in the sex ratio of age groups 25 to 44. As a result, the sex ratio among these age groups dropped on average 20 points between 1911 and 1921.

### A.2. Sources of Variation in Military Death Rates Across Départements

In this section, I explore the sources of variation in military death rates across départements. I show that military death rates were not randomly distributed. Instead, their distribution was result of the geographical organization of the army, and of the policies implemented by the Ministry of War to sustain the industrial war effort.

*The Geography of the Organization of the Army in 1914.* The first source of variation in military death rates across départements stems from the geography of the organization of the
Table 1: Estimates of Changes in Sex Ratios on Military Death Rates (1911-1921)

<table>
<thead>
<tr>
<th>Age group:</th>
<th>20-24</th>
<th>25-29</th>
<th>30-34</th>
<th>35-39</th>
<th>40-44</th>
<th>45-49</th>
<th>50-54</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death rate</td>
<td>0.61</td>
<td>-0.46**</td>
<td>-0.58***</td>
<td>-0.37***</td>
<td>-0.32**</td>
<td>-0.09</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>[0.95]</td>
<td>[0.19]</td>
<td>[0.13]</td>
<td>[0.13]</td>
<td>[0.13]</td>
<td>[0.14]</td>
<td>[0.12]</td>
</tr>
<tr>
<td>Départements</td>
<td>87</td>
<td>87</td>
<td>87</td>
<td>87</td>
<td>87</td>
<td>87</td>
<td>87</td>
</tr>
<tr>
<td>R²</td>
<td>0.006</td>
<td>0.061</td>
<td>0.170</td>
<td>0.089</td>
<td>0.101</td>
<td>0.008</td>
<td>0.000</td>
</tr>
<tr>
<td>Mean sex ratio 1911</td>
<td>107</td>
<td>99</td>
<td>100</td>
<td>100</td>
<td>99</td>
<td>99</td>
<td>97</td>
</tr>
<tr>
<td>Mean sex ratio 1921</td>
<td>86</td>
<td>80</td>
<td>82</td>
<td>84</td>
<td>91</td>
<td>96</td>
<td>95</td>
</tr>
</tbody>
</table>

Table 1 notes: This table reports the OLS coefficients from estimating specification 1. The dependent variable is the change in the sex ratio between 1911 and 1921 for a given age group. Sex ratios are defined as the ratio of the male population to the female population in percents. Robust standard errors are in brackets. See appendix C for details about variable sources and definitions. This table is similar to Table 2 in Boehnke and Gay (2017).

** Significant at the 1 percent level.  | Significant at the 5 percent level.  * Significant at the 10 percent level.

In 1914, the army was organized into twenty military regions. Both the recruitment of soldiers and the constitution of military units were structured by this territorial organization: at the beginning of the war, military units were constituted by soldiers from the same military region. As a result, soldiers from the same military region were initially sent to the same battlefields following the French deployment plan designed in 1912—the Plan XVII (Joffre 1932). This deployment plan assigned each military unit to a predetermined area in the case of an invasion by German troops. Gonzalez-Feliu and Parent (2016) show that the allocation logic of military units in the plan XVII was the outcome of an optimization problem in which the objective of the military command was to minimize the travel time of military units between their military regions of origin and the front, with the railroad network as the main constraint. The distribution of military units along front lines was therefore exogenous to the posterior level of violence in battles. However, as military fatalities soon

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8The basis of this system was given by the law of the general organization of the army of July 24th, 1873. The geography of the army was then only marginally readjusted until WWI. The exact geography that prevailed in August 1914 was fixed by the law of December 22nd, 1913 (Boulanger 2001, pp. 16–24). See the Journal Officiel de la République Française, Lois et Décrets, 45 (349), pp. 11009–11010, dated December 24th, 1913.

9See Joffre (1932) and Le Hénaff (1922) for a historical account of the preparation and application of the transportation plan of military units along the lines of the Plan XVII.
accumulated, the military command changed its affectation policy: starting January 1915, soldiers were allocated to any military unit based on each unit’s needs, thereby effectively pooling together soldiers from different military regions.\textsuperscript{10}

The geography of the organization of the army has two implications. On the one hand, départements that did not belong to the same military region could have had relatively different military death rates because their military units were assigned to different battlefields at the beginning of the war, with presumably different levels of fatalities. On the other hand, départements that belonged to the same military region could have had relatively similar military death rates, for the same reason. The latter might reduce the extent of the variation in military death rates across départements that were within the same military region. However, the correlation of military death rates across départements within the same military region is small at 0.12, presumably because soldiers from different military regions were pooled into the same military units soon after the beginning of the war.

Demographic and Economic Characteristics. I now explore how pre-war economic and demographic characteristics help explain variations in military death rates across départements. I regress military death rates on pre-war characteristics and report the results in Table 2. A clear pattern emerges: more rural départements experienced more military fatalities. The rurality of a département can be captured by two characteristics: the share of rural population—in the censuses, it is defined as the share of the population that resides in cities with less than two thousand inhabitants—, and the share of the residing population born in the département.\textsuperscript{11} These two variables explain most of the variation in military death rates across départements, as each one explains over 60% of its variance—see columns (1) and (2). In column (3), I regress military death rates on characteristics that should most likely be correlated with later female labor participation rates: the contemporaneous female labor participation rate, a measure of female education, the fertility rate, and the personal wealth per inhabitant. Only the fertility rate is significantly correlated with military death rates. These four variables together explain only about 30% of the variance in military death rates. When adding the two measures of rurality together with additional characteristics in column (4), only the measures of rurality are meaningfully correlated with military death rates.\textsuperscript{12}

\textsuperscript{10}This change in affectation policy was allowed by the circulaire of December 6th, 1913, in the case of war time (Boulanger 2001, p. 253).

\textsuperscript{11}The average personal wealth per inhabitant or the share of active population working in agriculture also capture some aspects of rurality, but all the variation in these variables across départements is captured by the share of rural population and the share of the residing population born in the département.

\textsuperscript{12}These additional characteristics consist of average height, population, the share of men working in industry, in agriculture, the share of the literate population, and the average direct taxes per inhabitant.
Regressing military death rates on these two measures alone in column (5) barely affects the coefficients. Importantly, they together explain 74% of the variation in military death rates across départements, against 79% when including eleven additional variables, as in column (4).

Table 2: Estimates of Military Death Rates on Pre-War Characteristics (1911)

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>Military death rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td>Share rural population</td>
<td>0.18***</td>
</tr>
<tr>
<td>[0.02]</td>
<td>[0.02]</td>
</tr>
<tr>
<td>Share born in département</td>
<td>0.26***</td>
</tr>
<tr>
<td>[0.03]</td>
<td>[0.03]</td>
</tr>
<tr>
<td>Female labor participation rate</td>
<td>-0.09</td>
</tr>
<tr>
<td>[0.06]</td>
<td>[0.04]</td>
</tr>
<tr>
<td>Share girls aged 5 to 19 in school</td>
<td>0.13</td>
</tr>
<tr>
<td>[0.09]</td>
<td>[0.07]</td>
</tr>
<tr>
<td>Fertility rate</td>
<td>0.82***</td>
</tr>
<tr>
<td>[0.25]</td>
<td>[0.17]</td>
</tr>
<tr>
<td>Personnal wealth (thousand francs)</td>
<td>-0.00</td>
</tr>
<tr>
<td>[0.00]</td>
<td>[0.00]</td>
</tr>
<tr>
<td>Demographic characteristics</td>
<td>No</td>
</tr>
<tr>
<td>Economic characteristics</td>
<td>No</td>
</tr>
<tr>
<td>Départements</td>
<td>87</td>
</tr>
<tr>
<td>R^2</td>
<td>0.686</td>
</tr>
</tbody>
</table>

Table 2 notes: This table reports the OLS coefficients from regressing military death rates on various pre-war département characteristics. The Demographic and Economic characteristics are average height, population, the share of men working in industry, in agriculture, the share of the literate population, and the average direct taxes per inhabitant. See appendix C for details about variable sources and definitions. Robust standard errors are in brackets.

** Significant at the 1 percent level. *** Significant at the 5 percent level. * Significant at the 10 percent level.

Two reasons explain the correlation between military death rates and rurality. As the war lasted longer than anticipated, the military command’s plan to supply troops with weapons and machinery proved highly insufficient (Bostrom 2016, Porte 2005, pp. 73–82). For instance, it did not schedule any production of new military equipment, providing only fifty thousand workers allocated across thirty war factories (Porte 2006, p. 26). It was
not until January 1917 that a proper ministry of armament was created. To cope with the ongoing war effort in conjunction with the lack of available civilian labor as well as the German occupation of the north-eastern industrial départements, from August 1915 onwards, the Ministry of War withdrew soldiers with manufacturing skills from the front lines and allocated them into war factories. As a result, up to 560 thousand soldiers who should have been on the front lines were working in war factories during the conflict—Appendix Table B.1 provides a detailed account of the number of mobilized soldiers outside of armed services throughout the war. Overall, soldiers from more industrial areas, or, equivalently, from less rural ones, were less likely to die in combats because of the policies implemented by the Ministry of War to support the industrial war effort.

Military death rates and migration patterns—as captured by the share of the residing population born in the département—are also correlated. To explore this correlation in more details, I build a direct measure of migration flows at the département level and compute the share of the population that was “in excess” in 1911 based on yearly flows of births and deaths, starting in 1901. I regress military death rates on this measure and I find that départements with more migration outflows had relatively more military fatalities. Furthermore, the share of the residing population born in the département is a strong predictor of these migration outflows: regressing the population in excess on the share of the residing population born in the département generates a coefficient of -0.36, with a standard error of 0.04.

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13 The Ministère de l’Armement was created by the decree of December 31st, 1916 (Journal Officiel de la République Française, Lois et Décrets, 49 (1), pp. 18–19, dated January 1st, 1917).

14 This allocation policy was allowed by the law Dalbiez of August 17th, 1915, which stipulated the following. “The Ministry of War is authorized to allocate to corporations, factories, and mines working for the national defense men belonging to a mobilized or mobilizable age class, industrial managers, engineers, production managers, foremen, workers, and who will justify to have practiced their job for at least a year in those corporations, firms and mines, or in comparable corporations, firms, and mines” (art. 6, Journal Officiel de la République Française, Lois et Décrets, 47 (223), pp. 5785–5787, dated August 19th, 1915). From 1916 onwards, the military command also allocated soldiers into mines to increase steel production.

15 Additionally, compared to the urban population, the rural population was less educated, lacking the skills to be hired by military administrations operating far from battle zones. As a result, administrative jobs were mostly given to soldiers from urban areas (Ridel 2007). The lower military death rates in industrial départements induced by the Law Dalbiez were eventually mitigated by the mobilization of soldiers into harvesting from 1917 onwards. This re-allocation was authorized by the law Mourier of February 20th, 1917 (Journal Officiel de la République Française, Lois et Décrets, 49 (51), p. 1408, dated February 21st, 1917).

16 More precisely, the share of population in excess in département $d$ in 1911 is calculated as $\frac{\text{population}_{d,1911} - \left(\text{population}_{d,1901} + \sum_{t=1901}^{1911} \text{births}_{d,t} - \sum_{t=1901}^{1911} \text{deaths}_{d,t}\right)}{\text{population}_{d,1911}} \times 100$. 
and an $R^2$ of 79%. This confirms the interpretation that emigration départements—those undergoing rural exodus—had more military fatalities.

Finally, the distribution of military death rates was not correlated with pre-war trends in female labor participation. Regressing military death rates on pre-war changes in female labor participation, I find that départements exposed to higher military death rates had a slight relative decline in female labor participation before the war, but the coefficients are not significant (see columns (1) and (4) of Appendix Table B.2). Those rural départements were experiencing the last consequences of the rural exodus, which had started in the mid-nineteenth century. Men and women alike were migrating to urban départements because of the progressive disappearance of proto-industries in rural areas. Controlling for pre-war changes in rurality in columns (3) and (6) weakens the correlation even more.

Overall, the relationship between military death rates and rurality can be thought of as the result of the policies implemented by the Ministry of War to sustain the industrial war effort. I interpret the residual variation in military death rates as non-systematic, related to the randomness at which soldiers encountered violence on the battlefield. Many war novels describe this phenomenon. Among others, Erich Maria Remarque writes: “It is by chance that I remain alive, just as it is by change that I can be hit. In the bombproof shelter, I can be torn to pieces, while in the open under ten hours of the most violent bombardments, I may not receive a scratch” (Remarque 1929).

### B. The Missing Men and Interwar Female Labor Participation

To assess the impact of WWI military fatalities on female labor participation in the interwar period, Boehnke and Gay (2017) exploit differential changes in female labor participation before and after the war across départements exposed to varying levels of military death rates. In their analysis, female labor participation is measured at the département level using the seven French censuses between 1901 and 1936. They estimate the following difference-in-differences specification:

$$FLP_{d,t} = \beta \text{death rate}_d \times \text{post}_t + \theta X'_{d,t} + \gamma_d + \delta_t + \varepsilon_{d,t},$$

where $FLP_{d,t}$ is female labor participation in département $d$ and census $t$, $\text{death rate}_d$ is the military death rate of département $d$, $\text{post}_t$ is an indicator for $t > 1918$, $\gamma_d$ is a département

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17While a higher share of the residing population born in the département may mean either more immigration or more emigration, the later is the case. See Tugault (1970, 1973) and Ogden and White (2002, chapter 2) for more details on internal migrations in France in the early twentieth century.

18Cited in Guillot and Parent (2015, p. 2).

19See Boehnke and Gay (2017, III.A) for a thorough discussion of how female labor participation is measured in the censuses.
fixed effect, and $\delta_t$ a census-year fixed effect. $X_{d,t}$ is a vector containing the two time-varying covariates correlated with the distribution of military death rates: the share of rural population, and the share of the residing population born in the département.$^{20}$

The difference-in-differences estimates imply that in départements exposed to military death rates of 20% rather than 10%—equivalent to switching from the 25th to the 75th percentile of the distribution—, female labor participation was 4 percentage points higher in the interwar period. This corresponds to an increase of 12% in female labor participation compared to pre-war levels. Put differently, losing ten men during the war induced on average about two women to enter the labor force. Figure 3 reports year-specific estimates along with 95% confidence intervals.

Figure 3: Estimates of Female Labor Participation on Military Death Rates
Year-Specific Difference-in-Differences Estimates

Figure 3 notes: The dots correspond to the OLS year-specific coefficients from estimating the following specification: $FLP_{d,t} = \sum_{t=1901,t\neq 1911}^{1936} \beta_t \text{death rate}_d \times \text{year}_t + \theta X'_{d,t} + \gamma_d + \delta_t + \varepsilon_{d,t}$. Standard errors are clustered at the département level. The vertical lines represent 95% confidence intervals around the estimates. This figure corresponds to Figure 5 in Boehnke and Gay (2017).

These estimates are robust to relaxing the parallel-trends assumption in four ways. First,$^{20}$

Other determinants of female labor participation such as the fertility rate, or female education, are not included in specification 2 as they are likely to have been affected by military fatalities. As a result, including them as controls could confound the post-treatment relationship between military fatalities and female labor participation.
Boehnke and Gay (2017) control for département-specific time trends—linear, quadratic, cubic, and quartic. Second, using grouped fixed effects, they allow for time-varying heterogeneity across groups of départements, where no *a priori* structure on group membership is imposed (Bonhomme and Manresa 2015). Third, they exploit randomness in the recruitment process of the army to use an instrumental variables approach combined with the difference-in-differences strategy. Finally, they run the analysis separately on groups with similar pre-war observable characteristics. All strategies lead to similar results, which are in line with the baseline estimates. They further show that the increase in female labor was driven by women who entered the labor force after the war rather than during the war, and that it was driven by changes in marriage market conditions. On the one hand, many young single women had to enter the labor force while searching longer for a husband because of the tightness of the post-war marriage market (Abramitzky, Delavande and Vasconcelos 2011), and, on the other hand, many older war widows had to enter the labor force to compensate for the loss of their husbands’ incomes.

III. The Persistent Legacy of the Missing Men

A. The Epidemiological Approach

To assess the legacy of WWI military fatalities on women’s working behavior at the individual level in the long run, I use an empirical strategy that mirrors the epidemiological approach to culture (Fernández 2011). Because the relationship between inherited norms and behavior may be co-determined by economic and institutional environmental factors, the epidemiological approach identifies the role of culture by analyzing the behavior of individuals with different geographical origins—migrants—but living in the same environment, thereby facing similar constraints when making decisions. For instance, to identify the role of cultural origins for the working behavior of women independent of confounding institutional factors, a growing body of literature analyzes the working behavior of first- and second-generation female immigrants to the U.S. as a function of female labor participation rates or other measures of gender roles in their countries of origin (Fernández and Fogli 2009, Blau and Kahn 2015, Gay et al. 2017). The underlying assumption in the epidemiological approach to culture is that migrants carry the preferences and beliefs of their countries of origin, and

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21 They also show that their results are robust to spatial correlation across départements, to alternative measurements of female labor participation and military death rates, to differential pre-war health conditions and enlistment rates, and to pre- and post-war migration patterns. Finally, they collect historical data on war destructions and the post-war reconstruction, and show that the départements in which war combats occurred do not display heterogeneous responses.
transmit them to their children. As a result, while the validity of this strategy is superior to cross-country studies, its ability to detect a relationship between origin country norms and behavior is constrained by design. This is not an issue in the case at hand: as I show below, the magnitude of the shock of WWI military fatalities was large enough for intergenerational transmission effects to be substantial even one century later.

Why use the epidemiological approach in this context? If WWI military fatalities induced changes the structures of local labor markets in the long run, the incentives faced by individuals when making decisions would be different across locations that were exposed to varying levels of military death rates. For instance, Eder (2017) finds that WWII military casualties in Austria had a long-run impact on the structures of local labor markets, with rural municipalities exposed to more WWII military casualties having a smaller service sector today. Should this be the case in France as well, given that women predominantly work in the service sector, women residing in départements exposed to high military death rates would have lower labor force participation rates today because of demand-side factors. To identify the portable component of the legacy of military fatalities from WWI and disentangle intergenerational transmission channels from confounding institutional factors, I leverage on variations in the working behavior of women who make decisions under similar institutional constraints but whose geographical origins differ in their exposure to WWI military fatalities.


To analyze the reduced-form impact of WWI military fatalities on women’s working behavior, I combine all the French censuses for which microdata are available. This is the case for the thirteen censuses between 1962 and 2012. Except for the censuses of 1962 and 1999, which are 5% samples of the population, the other eleven censuses are 20% to 25% samples of the population. The regression sample consists of internal migrant married women aged 30 to 49, born and residing in metropolitan France with a French husband present in the household. In total, it contains about 6.5 million households—Table 3 reports the number

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22Migrants are also likely to assimilate and acquire local social norms over time so that the association between origin-country norms and behavior should progressively weaken (Abramitzky et al. 2016), although this phenomenon may be mitigated if migrants self-select into areas where migrants with similar origins are concentrated.

23The censuses for which microdata are available are the ones of 1962 (5% sample), 1968 (25% sample), 1975 (20% sample), 1982 (25% sample), 1990 (25% sample), 1999 (5% sample), and every year between 2006 and 2012 (20% samples). Microdata for the earlier censuses (1954, 1946, 1936, 1931, 1926, 1921, 1911, 1906, and 1901) are not available.

24Metropolitan France consists of mainland France and Corsica.
of households per census.

Internal migrants are individuals who reside in a département that is different from their département of birth. Between 1962 and 2012, the share of internal migrants among married women aged 30 to 49 has gradually increased from 38% to 50% (see the blue curve on Appendix Figure A.1). I focus on women aged 30 to 49 to ensure that education investments are completed, and to abstract from retirement considerations. Moreover, the sample is restricted to women born and residing in metropolitan France because WWI military fatalities data are only available for metropolitan départements. For the same reason, I further exclude individuals born or residing in the three départements that France recovered after WWI—Bas-Rhin, Haut-Rhin, and Moselle (all three hatched on Figure 2). Finally, I restrict the sample to married women whose husbands are present in the household in order to perform analyses that include husband and household characteristics, and to explore the role of husbands and mothers-in-law in the transmission of the legacy of the missing men.25 Moreover, focusing on married women is of substantial interest as their entrance in the labor force has been one of the most dramatic changes in labor markets across industrialized countries in the twentieth century (Goldin 2006). They also display the largest variations in working behavior. Appendix Figure A.2 displays the sample means for labor, fertility, and education variables from 1962 to 2012. It shows that the share of working women in the sample has been steadily increasing from 30% in the early 1960s to 80% in the late 2000s. I report the full set of summary statistics for each census in Appendix 2.

How do internal migrants compare to non-migrants? Regressing individual characteristics on migration status, I find that migrant and non-migrant women are broadly alike—although migrant women are slightly more educated than non-migrant women.26 Importantly, there is no systematic correlation between migration status and military death rates, nor between migration status and labor market outcomes. This suggests that sample selection through migration is unlikely to drive the correlation between military death rates and labor market outcomes. I run below a battery of robustness checks to substantiate this intuition. This lack of correlation is hardly surprising. First, about 72% of women in the regression sample migrated more than a decade before. As a result, any labor-related shock resulting from migration should have attenuated. Second, most women in the regression sample migrated only a short distance (230 kilometers on average), suggesting that a significant share of these internal migrants relocated for reasons related to housing markets rather than labor

25 The share of married women aged 30 to 49 has gradually declined from 86% to 63% (see the red curve on Appendix Figure A.1). Technically, I also include women that are in a couple with a male present in the household, e.g., those in a civil union. This type of couples are only prevalent in the censuses in the 2000s.

26 The last column of the summary statistics tables in Appendix 2 reports the estimates for each census.
markets. Finally, migrant women in France are usually tied movers as they follow their husbands, rather than the contrary (Pailhé and Solaz 2008).

C. Empirical Strategy

I estimate the following specification separately for each of the thirteen censuses between 1962 and 2012:

\[
\text{working}_{ibrt} = \beta \text{death rate}_b + \gamma_1 X_i' + \gamma_2 \tilde{X}_{1911,b} + \mu_{1914,b} + \delta_r + \varepsilon_{ibrt},
\]

where \( \text{working}_{ibrt} \) is an indicator for whether individual \( i \), born in département \( b \), and residing in département \( r \) in census \( t \), is working. Vector \( X_i \) contains a set of year of birth indicators. Vector \( \tilde{X}_{1911,b} \) is the set of pre-war controls capturing the systematic determinants of military death rates generated by the policies of the Ministry of War—the share of rural population and the share of the residing population born in the département. It also contains the main pre-war determinants of later female labor participation—the female labor participation rate, a measure of female education, the fertility rate, and the personal wealth per inhabitant. \( \mu_{1914,b} \) is a fixed effect for individual \( i \)'s military region of birth. There were twenty military regions in 1914, with four to five départements per military region on average (see Figure 2). Consistent with the epidemiological approach, this specification includes a fixed effect \( \delta_r \) for individual \( i \)'s département of residence.

The coefficient of interest \( \beta \) is identified off variations in the working behavior of migrant married women in the same cohort, residing in the same département, but born in neighboring départements that were exposed to varying levels of military death rates. Because the key regressor varies at the level of the département of birth, the errors \( \varepsilon_{ibrt} \) may be positively correlated between individuals born in the same département. As a result, default standard errors may be biased downward—this issue is especially salient as the number of observations is very large. Moreover, labor market outcomes may be correlated within départements of residence because individuals residing in the same département are exposed to similar local labor market conditions. This may also lead to correlated errors within départements of residence, although this issue is mitigated by the presence of département of residence fixed effects as they should absorb common shocks driving the within département of residence correlation of errors. To alleviate the problem of correlated errors, I use two-way clustering and cluster standard errors both at the level of individuals’ départements of birth and départements of residence (Cameron and Miller 2015). As a result, all the regressions contain between 87 and 93 clusters for both départements of birth and départements of residence.\(^{27}\)

\(^{27}\)The increase in the number of départements across time stems from modifications of the administrative
D. Results

This section presents evidence that WWI military fatalities had a persistent impact on women’s working behavior. I first report the baseline estimates (section D.1). Then, I run a series of robustness checks (section D.2). I also replicate the analysis on stratified samples (section D.3) and with alternative outcomes (section D.4). In section D.5, I run a household-level analysis. Finally, I corroborate the results obtained with the censuses by replicating the analysis on an alternative dataset, the annual labor surveys between 1982 and 2013 (section D.6). Using the labor surveys, I also show that unobserved heterogeneity in human capital do not drive the results (section D.7).

D.1. Baseline Estimates

Figure 4a reports the OLS coefficients from estimating specification 3 separately for each census along with 95% confidence intervals. Throughout the analysis, I use the following metric to interpret regression results: I compare individuals born in départements exposed to low military death rates (10%) to individuals born in départements exposed to high military death rates (20%). This roughly corresponds to switching from a median département in the low group (25th percentile) to a median département in the high group (75th percentile). The estimates imply that women born in départements exposed high military death rates (20%) rather than to low military death rates (10%) were 5 percentage points more likely to be working between 1962 and 2012. The estimates are all significant at the 1% level and stable across time. However, because average female labor participation rates increased from 30% in the early 1960s to 80% in the late 2000s, the magnitude of the estimates relative to the mean declined, from 17% of the mean in 1968 to 6% of the mean in 2012 (see Appendix Figure A.3). The results are similar when the outcome is the indicator Labor force participant (see Appendix Figure A.4, which replicates Figure 4).

How do these results compare with estimates from using the more classical, location-based approach, to assess the long-run impact of WWI military fatalities? I estimate the following simple specification where, contrary to the epidemiological approach, I assign military death geography of the French territory. In 1968, the départements of the Seine (75) and Seine-et-Oise (78) were divided into the départements of Paris (75), Yvelines (78), Essonne (91), Hauts-de-Seine (92), Seine-Saint-Denis (93), Vale-de-Marne (94), and Val-d’Oise (95). As a result, metropolitan France had 87 départements before 1968, and 92 départements after 1968. This metric is similar to the one used in Boehnke and Gay (2017, p. 10), and in Abramitzky et al. (2011, p. 135).
Figure 4 notes: Panel (a) reports the OLS coefficients from estimating equation 3. All regressions contain cohort, département of residence, and military region of birth fixed effects, as well as the set of historical controls measured at the level of individual’s départements of birth in 1911. They consist of the share of rural population, the share of the residing population born in the département, the female labor participation rate, the fertility rate, the share of girls aged 5 to 19 who go to primary or secondary school, and the average private wealth per inhabitants in Francs. Standard errors are clustered both at the level of individuals’ départements of birth and départements of residence. The sample consists of migrant married women aged 30 to 49 with a husband present in the household. See Table 3 for details about sample sizes for each census year. Tables in Appendix 2 report the results for each census year separately. Panel (b) reports the OLS coefficients from estimating equation 4. All regressions contain cohort and military region of residence fixed effects, as well as the set of historical controls measured at the level of individual’s départements of birth in 1911. Standard errors are clustered at the level of individual’s départements of residence. The sample consists of non-migrant married women aged 30 to 49 with a husband present in the household. The estimates are computed using the sample weights provided in the censuses. See appendix C for details about variables sources and definitions.

- significant at the 1 percent level. ▲ significant at the 5 percent level. ■ significant at the 10 percent level.

rates and pre-war variables at the level of the département of residence:

\[
\text{working}_{irt} = \beta \text{death rate}_r + \gamma_1 X'_i + \gamma_2 \tilde{X}'_{1911,r} + \mu_{1914,r} + \varepsilon_{irt},
\]

where \( r \) indexes départements of residence. In order to capture the legacy of the war that operated both through individuals and local institutional structures, I use the sample of non-migrant married women aged 30 to 49. This specification does not contain location fixed effects.
effects. As a result, the coefficient of interest $\beta$ is identified off variations in the working behavior of non-migrant married women in the same cohort, and residing in neighboring départements that were exposed to varying levels of military death rates. Standard errors are clustered at the level of individuals’ départements of residence.

I report the results in figure 4b. The estimates imply that women residing in départements exposed to high military death rates (20%) rather than low military death rates (10%) were from 7 to 10 percentage points more likely to be working between 1962 and 2012. As long as there is no heterogeneity in the long-run impact of WWI military fatalities across migration status, these results imply that 40% to 55% of the overall legacy the missing men operated directly through individuals rather than through changes on local institutional structures.

D.2. Robustness

I this section, I present a series of robustness checks. I show that the results are not sensitive to the choice of the regression model, that education and fertility choices do not confound the correlation between military fatalities and women’s working behavior, and that selective migration patterns do not drive the results.

Regression model. The baseline results are estimated through a linear probability model. This modeling choice does not affect the results. Figure 5a reports the estimates when using different probability models to estimate specification 3. Marginal coefficients evaluated at the mean of the data from a Probit model, a Logit model, and OLS coefficients are identical.

Education and Fertility. Labor market decisions of married women are affected by various factors such as their level of education and their number of children. But education and fertility choices may also be dependent upon the long-run impact of WWI military fatalities, and thus confound the relationship between women’s working behavior and military death rates. For instance, if women born in départements exposed to higher military death rates hold more favorable views toward being a working wife, they may anticipate a longer career from the onset, and thus invest more in education when young. This initial investment in education may in turn increase their likelihood to enter the labor force when adults. To check that these potential channels are of second order and do not drive the results, I augment the baseline specification with a set of educational attainment indicators—no schooling (omitted), vocational education, high school, and higher education—as well as a control for the number of children in the household. These additional controls do not affect the results (see Figure 5b). This comforts the idea that the long-run impact of WWI military fatalities
was direct rather than mediated by education and fertility choices.

Selective Migration Patterns. Because the coefficients of interest are identified off variations in the behavior of internal migrants, selective migration could be an important mechanism if in- and out-migration patterns were correlated with military death rates.

Consider first selective out-migration. Suppose that WWI modified local industrial structures in the long run, as did WWII in Austria (Eder 2017). The resulting industrial structure inherited from WWI could then be sensitive to asymmetrical external shocks, pushing workers disproportionately out of these départements in some periods, thereby generating the correlation with military death rates. I alleviate this concern by effectively comparing individuals born in neighboring départements as they presumably share many features including external shocks and industrial structures. I implement this strategy by including twenty military region of birth fixed effects in the baseline specification, with each military region containing four to five départements on average. This strategy has the additional advantage of making the conditional independence assumption more plausible, as soldiers from the same military region were sent to similar battlefields, making the distribution of military death rates more likely to be idiosyncratic within military regions.

Consider now selective in-migration. The epidemiological approach requires comparing individuals facing similar economic and institutional constraints. Yet, individuals residing in the same département may not all face similar local labor market conditions. If individuals from départements exposed to higher military death rates systematically migrated to the more dynamic local labor markets in a département, then at least part of the long-run impact of WWI military fatalities would be attributable to selective in-migration patterns. To verify that such patterns do not drive the results, I compare individuals residing within the same local labor market. The censuses provide two ways of defining local labor market boundaries. First, they provide a constructed measure of the local labor market respondents reside in. These local labor markets—denominated Zones of Industrial and Urban Population (ZIUP) from 1962 to 1990, and Economic Zones (EZ) from 1999 to 2012—are constructed based on home-work migration patterns for each census.29 As shown in Table 3, ZIUPs are more numerous than EZs: depending on the census, the regression sample contains 600 to 800 ZIUPs with 70 to 800 households per ZIUP on average, and 300 EZs with 2,000 households per EZ on average.30 Second, the censuses provide the city the respondents reside in. From 1962 to 1999, this information is detailed at the level of the commune—France’s smallest

29See appendix C for more details on how ZIUPs and EZs are constructed.
30Moreover, ZIUPs do not cover the full territory as some rural areas are not included in a ZIUP—between 84% and 96% of respondents in the regression sample reside in a ZIUP.
administrative level—, and from 2006 to 2012, it is detailed at the level of the canton-
city—a slightly higher aggregation level. Depending on the census, the regression sample
contains 6,000 to 23,000 communes with 9 to 23 households per commune on average, and
3,500 canton-cities with 200 households per canton-city on average.\textsuperscript{31} To assess the extent
of selective in-migration, I replicate the baseline specification successively with local labor
market and city fixed effects instead of the département of residence fixed effects (see Figure
5c). The coefficients are similar across specifications, suggesting little correlation between
WWI military fatalities and in-migration sorting within destination départements.

Table 3: Residence Location Units

<table>
<thead>
<tr>
<th>Census</th>
<th>Hh</th>
<th>Local labor markets</th>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Def.</td>
<td>Units</td>
</tr>
<tr>
<td>1962</td>
<td>64,145</td>
<td>ZIUP</td>
<td>801</td>
</tr>
<tr>
<td>1968</td>
<td>419,366</td>
<td>ZIUP</td>
<td>790</td>
</tr>
<tr>
<td>1975</td>
<td>337,463</td>
<td>ZIUP</td>
<td>857</td>
</tr>
<tr>
<td>1982</td>
<td>464,979</td>
<td>ZIUP</td>
<td>859</td>
</tr>
<tr>
<td>1990</td>
<td>501,485</td>
<td>ZIUP</td>
<td>596</td>
</tr>
<tr>
<td>1999</td>
<td>106,067</td>
<td>EZ</td>
<td>331</td>
</tr>
<tr>
<td>2006</td>
<td>660,780</td>
<td>EZ</td>
<td>331</td>
</tr>
</tbody>
</table>

Table 3 notes: This table describes the types of residence location units available in the censuses besides the département of residence. The sample consists of migrant married women aged 30 to 49 with husbands present in the household. \% in sample corresponds to the share of households in the original regression sample that reside inside a ZIUP. Singletons correspond to the number of households that are the only ones to reside in a given commune or canton-city. These households are effectively dropped in regressions using city fixed effects. See appendix C for a definition of ZIUPs, EZs, communes, and canton-cities. Acronyms: ZIUP = Zone of Industrial and Urban Population; EZ = Economic Zone; Hh = Households; Def = Definition. The censuses 2007 to 2012 contain a similar number of households and units as the census of 2006.

\textsuperscript{31}Communes are such a small level of aggregation that several thousands of households are singletons, i.e., they are the only households to reside in a given commune. These households are effectively dropped in regressions using commune fixed effects.
To further ensure that labor-related migrations do not drive the results, I control for the relative attractiveness of individuals’ origin and destination départements. I build two types of measures: one that is département specific, and one that is dyadic. The département-specific measures are the share of immigrants among the population residing in an individual’s destination département, and the share of emigrants among the population born in her origin département. The first measure captures the pull force of destination départements, and the second measure the push force of origin départements. The dyadic measures are specific to each pair of départements. The first dyadic measure is the share of immigrants born in an individual’s origin département among the population of immigrants in her destination département. It captures the pull force of destination départements specifically toward each origin département. Conversely, the second dyadic measure is the share of emigrants in an individual’s destination département among the population of emigrants born in her origin département. It captures the push force of origin départements specifically toward each destination département. Because labor-related migrations usually peak early in the life-cycle (White and Lindstrom 2005), I build these measures relative to the time when individuals were aged 25. Moreover, I build these measures relative to the female population of working age to better capture female labor-related migration dynamics. Together with the bilateral distance between origin and destination départements, these four variables are likely to capture a substantive part of the bias introduced by labor-related migration patterns. I also estimate the baseline specification on the subsample of internal migrants who were already present in their current département of residence in the previous census—the “one-and-a-half” generation. This subsample may be less subject to biases due to selective migration as it contains individuals who migrated at least one decade earlier. Overall, the bias introduced by labor-related migrations may not be as serious an issue as département of residence fixed effects control for the permanent relative attractiveness of a département, and because the concentration of population into départements with more dynamic labor markets—the more urban départements—has been low in the second half of the twentieth century. Instead, this type of labor-related migrations occurred in the late nineteenth and

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32 The censuses do not provide information on the timing of migration except whether respondents migrated more than a decade before.

33 For the decades 1960 to 2010, these measures are calculated using the censuses from 1962 to 2006. For earlier decades, I use information on bilateral migration flows between départements in the censuses of 1911 and 1946—these are the only censuses before 1962 for which this information is available. Because the administrative geography of the French territory underwent various modifications before 1962, some former départements cannot be mapped into newly created ones, such as the département of Seine-et-Oise. As a result, some respondents cannot be assigned migration controls, especially in the earlier censuses.

34 This information is not available in the censuses after 2009.
early twentieth centuries (Combes, Lafourcade, Thisse and Toutain 2011). Figure 5d reports the results. Including the migration controls or estimating the baseline specification on the “one-and-a-half” generation of migrants only slightly decreases the estimates. This suggests that selective migration is not a primary mechanism that can explain the patterns in the data.

All the results are similar when the outcome is the indicator Labor force participant (see Appendix Figure A.5, which replicates Figure 5). The full set of results for both outcomes is available in table form in Appendix 2.

Inaccurate Assignment of Military Death Rates. There is a measurement concern when using census microdata from 1962 onwards together with the epidemiological approach to assess the long-run impact of WWI military fatalities. The epidemiological approach requires the key regressor to be assigned at the level of migrants’ cultural origins. Here, military death rates should be assigned at the level of the département in which migrants’ ascendants were residing right after WWI, when the scarcity of men induced an increase in female labor participation. Unfortunately, the censuses do not provide parental origins. As a result, it is necessary to assume that migrants’ départements of birth correspond to their départements of origin, i.e., the départements in which their ascendants were residing right after WWI. While the regression sample for the census of 1962 contains individuals born from the 1910s to the 1930s, the assumption that migrants’ départements of birth corresponds to their départements of origin is increasingly stringent over time, as about half of the female population aged 30 to 49 between 1962 and 2012 was residing outside their département of birth (see Appendix Figure A.1). The analysis in section IV.B explicitly relaxes this assumption when using the extended version of the labor surveys as they provide the départements of birth of respondents’ parents. This analysis shows that the potential inaccurate assignment of military death rates using the censuses creates a slight attenuation bias in the baseline estimates.

D.3. Stratification

I estimate the baseline specification on various subsamples to assess the extent of heterogeneity in the response to WWI military fatalities across categories of women. I stratify the sample by marital status, education level, age, and fertility. The results are reported in

35 For earlier censuses, the baseline estimates and those controlling for migration are not fully comparable as the sample is different; the migration controls are not defined for a substantive portion of the sample because of changes in the administrative geography of the French territory throughout the twentieth century (see footnote 33).
Figure 5: Estimates of Working on Military Death Rates, Robustness
Sample: Migrant Married Women Aged 30 to 49, Husbands Present
Censuses: 1962–2012

Figure 5 notes: Panel (a) reports the OLS coefficients from estimating specification 3 with three different probability models. For the Probit and the Logit models, I report the marginal coefficients evaluated at the mean of covariates. Panel (b) augments the baseline specification with educational attainment fixed effects and the number of children in the household. Panel (c) reports the OLS coefficients from estimating specification 3 with successively département of residence fixed effects, local labor market fixed effects (ZIUP and EZ), and city fixed effects (commune and canton-city). Panel (d) restricts the sample to migrants who were living in their département of residence in the previous census. It also augments the baseline specification with the bilateral distance between origin and destination départements and with the département-specific and dyadic migration controls. See Figure 4 notes for more details.

• significant at the 1 percent level. ▲ significant at the 5 percent level. ■ significant at the 10 percent level.
Appendix Figure A.6. The impact of WWI military fatalities is driven by married women, especially before the 2000s. Moreover, the effect of the war is relatively stronger for women with lower levels of education, as well as for younger women. Finally, there is no heterogeneity across women with different levels of fertility.

D.4. Alternative Outcomes

As discussed above, WWI military fatalities may have affected fertility and education choices in the long run. To check this possibility directly, I estimate the baseline specification on various fertility and education outcomes (see Appendix Figure A.7). I find no clear evidence that the war affected any of these outcomes (panels a and b). Moreover, conditional on being working, women born in départements exposed to high military death rates did not hold higher-status occupations (panel c). Finally, they did not marry at higher rates either (panel d). These results further suggest that the long-run impact of WWI military fatalities was direct, rather than mediated by education or fertility choices.

D.5. Household-Level Analysis

The censuses allow to match husbands and wives, thereby enabling a household-level analysis. I estimate the baseline specification when including husband and household characteristics. Husband characteristics include husbands age and age squared, indicator variables for their educational attainment, and an indicator for whether they are employed. Household characteristics include an indicator for whether the household owns its housing, the number of rooms in the home, and a measure of housing quality. These variables attempt to capture how wealthy a household is.\footnote{The censuses do not contain explicit wealth, income, or wage measures.} I report the results in Appendix Figure A.8. The baseline estimates are similar to the ones obtained when controlling for husband and household characteristics. That is, those characteristics are not correlated with military death rates, suggesting little selection in matching along these dimensions.


To corroborate the results obtained with the censuses, I combine all thirty-two annual labor surveys between 1982 and 2013, which provide respondents’ départements of residence and départements of birth. The annual labor surveys have both drawbacks and advantages over the censuses. On the one hand, information about respondents’ départements of birth is not available in the labor surveys prior to 1982, while it is available from 1962 onwards in census...
microdata. Moreover, the sample size of the labor surveys is considerably smaller than that of the censuses: while the censuses are usually 20% to 25% samples of the population, the labor surveys are 1.5% to 3% samples of the population. On the other hand, the labor surveys contain a wider range of labor market outcomes: besides providing labor status, they contain the number of hours worked, whether the respondent ever worked, whether she is a housewife, whether she works full time or part time, the number of months since she has been working in her current firm, and her monthly wage rate. Summary statistics are available in Appendix 2.

I pool the labor surveys and estimate the baseline specification on the sample of migrant married women aged 30 to 49 with husbands present in the household. I also include survey-year fixed effects. The results are reported in Appendix Table B.3. They are similar to those when using the censuses: for instance, the coefficient on the \textit{Working} outcome is 0.57 (s.e. of 0.15) compared to an average of 0.52 for the censuses of 1982–2012. The labor surveys provide other interesting results. While they are more likely to be in the labor force, women born in départements exposed to high military death rates are not more likely to have been previously working: the coefficient for \textit{Ever worked} is close to zero and not significant. Moreover, women born in départements exposed to higher military death rates are less likely to report being a housewife. They also work slightly longer hours, and remain much longer in their current firm. Finally, they are not more likely to work in full-time nor in part-time positions. These results suggest that women born in départements exposed to higher military death rates have a stronger attachment to the labor force and have longer careers across their life-cycles.

\textit{D.7. Unobserved Heterogeneity in Human Capital}

Although WWI military fatalities did not have a long-run impact on women’s education levels—so that observed heterogeneity in human capital cannot explain the results—, it is still possible that women from départements exposed to higher military death rates have higher unobserved human capital. To check that this is not driving the results, I estimate the baseline specification with the log monthly wages as the dependent variable on the restricted sample of working women. I report the results in Appendix Table B.4. The coefficient on military death rates is close to zero and not significant. Controlling for measures of education does not alter the results. I replicate the analysis using a Heckman selection model where husbands’ characteristics are used to control for selection into the labor force—husband age and age squared, education level and employment status.\footnote{The results are similar when using the number of children in the selection equation.} The results are similar to the
ones obtained with the restricted sample. Overall, potential heterogeneity in unobserved human capital do not drive the long-run impact of WWI military fatalities on women’s working behavior.

IV. Mechanisms of Historical Persistence

In this section, I uncover three mechanisms underlying the historical persistence of the impact of WWI military fatalities on women’s working behavior: horizontal transmission through the marriage market (section A), vertical intergenerational transmission (section B), and oblique intergenerational transmission (section C).  

38 Identifying each transmission channel independent of location-based effects requires using samples that may differ from the ones used in section III. As a result, the results in section IV may not fully relate to those in section III. Nevertheless, they are still informative as the characteristics of women in each of the sample used to analyze persistence mechanisms are very similar, which comforts the idea transmission channels at play in one sample are also at play in other samples.

39 Identifying the causal impact of a husbands’ origins on their wives’ working behavior is, however, difficult. Should such men induce their wife to be more likely to work—for instance by doing a larger share of household production—then women expecting to marry such men should anticipate and invest in market-related skills, making them more likely to work in the first place.
A.1. Homogamy in Military Death Rates

I first provide evidence of homogamy in military death rates: women born in départements exposed to high military death rates are more likely to marry with men born in départements exposed to high military death rates, and vice versa. For consistency with the analysis in section A.2, I restrict the sample to migrant married women aged 30 to 49 whose husbands are also first-generation migrants. Using the censuses between 1962 and 2012, I estimate the following specification:

\[
\text{death rate}_{ijhbrt}^{\text{husb}} = \beta \text{death rate}_b + \gamma_1 X'_i + \gamma_2 X'_{hj} + \gamma_3 \tilde{X}'_{1911,b} + \gamma_4 \tilde{X}'_{1911,h} + \delta_r + \eta \text{Same}_{bh} + \mu \text{dist}_{bh} + \varepsilon_{ijhbrt},
\]

where \( \text{death rate}_{ijhbrt}^{\text{husb}} \) is the military death rate exposure of the département of birth of husband \( h \) of wife \( i \) in household \( j \). Vector \( X_{hj} \) contains the same set of husband and household characteristics as those used in section III: husbands’ age, age squared, indicators for their educational attainment, an indicator for their employment status, an indicator for housing ownership, the number of rooms in the home, and a measure for housing quality. Vectors \( \tilde{X}_{1911,b} \) and \( \tilde{X}_{1911,h} \) are the set of pre-war controls corresponding to wives’ and husbands’ départements of birth, respectively. Wives’ and husbands’ military death rates will be positively correlated as individuals born in the same département are more likely to marry with one another—this is the case for 17% to 37% of couples in the regression sample, with a downward trend from 1962 to 2012. To assess the extent of homogamy in military death rates beyond marriages between individuals born in the same département, I include an indicator variable (\( \text{Same}_{bh} \)) for whether spouses were born in the same département as well as the log distance between wives’ and husbands’ départements of birth (\( \text{dist}_{bh} \)). This specification also includes fixed effect \( \delta_r \) for individual \( i \)’s département of residence.\(^{40}\) I use three-way clustering and cluster standard errors at the level of wives’ départements of birth, départements of residence, and also at the level of their husbands’ départements of birth.

I report the results in Figure 6. There is a positive correlation between spouses’ military death rates: in the baseline specification, each additional percentage point in military death rates exposure of wives’ départements of birth is associated with an increase of 0.27 to 0.50 percentage point in the military death rates exposure of their husbands’, with a downward trend from 1962 to 2012. Adding husband and household controls decreases the correlation a little for the earlier years. I later provide suggestive evidence that one reason behind of this homogamy in military death rates is the more progressive views toward gender roles.

\(^{40}\) Contrary to the analysis in section III, I do not include military region of birth fixed effects \( \mu_{1914,b} \) to allow for more variation in the set of potential matches between wives and husbands.
held by both women whose lineage was exposed to relatively more military fatalities (see section V.B). Homogamy in military death rates can be thought of as a source of historical persistence as this trait became more prevalent in the population of men and women as a result of WWI military fatalities.

Figure 6: Estimates of Husbands’ on Wives’ Military Death Rates
Sample: Migrant Married Women Aged 30 to 49, Migrant Husbands Present
Censuses: 1962–2012

Figure 6 notes: This figure reports the OLS coefficients from estimating specification 5. Standard errors are clustered at the level of wives’ départements of birth, départements of residence, and also at the level of their husbands’ départements of birth. The sample consists of migrant women aged 30 to 49 with a migrant husband present in the household. The estimates are computed using the sample weights provided in the censuses. See Figure 4 notes for more details.

• significant at the 1 percent level. ▲ significant at the 5 percent level. ■ significant at the 10 percent level.

A.2. Transmission from Husbands to Wives

To assess the role of husbands’ origins on the persistence of the legacy of the missing men more directly, I regress wives’ working behavior on the military death rates of their husbands’ départements of birth. I isolate the role of husbands’ origins from that of their wives’ by including wives’ département of birth fixed effects. This enables to effectively compare women born in the same département—and thus whose lineage was exposed to the same levels of military death rates—but whose husbands were born in départements exposed to varying
levels of military death rates. Again, I implement a strategy that mirrors the epidemiological approach to culture: to neutralize the role of institutional factors from husbands’ origins, I exclude from the regression sample non-migrant husbands as they may carry and transmit these location effects. I estimate the following specification on the sample of migrant married women aged 30 to 49 with a migrant husband present in the household:

$$\text{working}_{ijhbrt} = \beta \text{death rate}_h + \gamma_1 X'_i + \gamma_2 X'_{hj} + \gamma_3 \bar{X}'_{1911,h} + \delta_t + \omega_b + \epsilon_{ijhbrt},$$

where $\text{death rate}_h$ represents the military death rate exposure of the département of birth of husband $h$ of wife $i$ in household $j$, and $\omega_b$ is a wife département of birth fixed effect. The other variables are the same as in specification 5, and include household and husband characteristics. I use two-way clustering and cluster standard errors at the level of wives’ départements of residence and at the level of their husbands’ départements of birth.

I report the results in Figure 7. The coefficients of interest are identified off variations in the working behavior of migrant married women in the same cohort, residing in the same département, born in the same département, but whose husbands were born in départements exposed to varying levels of military death rates. The blue curve corresponds to the baseline results. The estimates are relatively stable across time and significant at conventional levels. They imply that women whose husbands were born in départements exposed to high military death rates (20%) rather than to low military death rates (10%) were 2 to 5 percentage points more likely to be working. The estimates decline slightly when including household and husband characteristics. They barely change when including fertility and education controls, which suggests that they are not channels of transmission.

How quantitatively important is this marriage market channel in explaining the long-run persistence of the legacy of the missing men? I first re-estimate the baseline results from section III using the sample of migrant married women with a migrant husband present in the household. I then add husbands’ département of birth fixed effects to isolate the role of wives’ origins from that of their husbands. This enables to effectively compare women whose husbands were born in the same département and therefore to neutralize the role of the marriage market as a channel of persistence. I report the results in Appendix Figure A.9.

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41 The results from this figure can be found in table form in appendix 2.
42 The characteristics of individuals in this sample are very similar to those of the individuals in the sample used to generate the baseline results (see the summary statistics tables in Appendix 2).
43 This strategy can only neutralize part of the role of the marriage market as a channel of persistence: if women anticipated marrying with such men, then they would make working decisions prior to marriage that would make them more attractive to these men. This strategy therefore neutralizes the post-marriage impact of husbands’ origins, such as the distribution of tasks within the household. It is therefore likely to be a lower bound.
In both cases, the results are broadly similar to the ones found in section III. Importantly, including husbands’ département of birth fixed effects makes the estimates decrease by 19% on average, suggesting that about one-fifth of the legacy of the missing men at the individual level persisted through the marriage market channel.

Figure 7: Estimates of Working on Husbands’ Military Death Rates
Sample: Migrant Married Women Aged 30 to 49, Migrant Husbands Present
Censuses: 1962–2012

Figure 7 notes: This figure reports the OLS coefficients from estimating specification 6. Standard errors are clustered at the level of individuals’ départements of residence and at the level of their husbands’ départements of birth. The sample consists of migrant women aged 30 to 49 with a husband present in the household. The estimates are computed using the sample weights provided in the censuses. See Figure 4 notes for more details.

- significant at the 1 percent level.
- ▲ significant at the 5 percent level.
- ■ significant at the 10 percent level.

B. Vertical Intergenerational Transmission

I now turn to vertical intergenerational transmission as a source of historical persistence of the legacy of the missing men. A large part of the process of preference formation happens early in life upon learning from the behavior of one’s parents (Fernández 2013) or from active socialization with them (Bisin and Verdier 2001, 2011). Among others, Farre and Vella (2013), using the NLSY79, show that mothers’ working behavior and beliefs about gender roles translate into their daughters’ (and sons’) own beliefs about gender roles when young,
which then impacts their daughters’ working behavior when older. Should this mechanism be also at play in France, women with mothers and fathers from départements exposed to higher levels of military death rates would be more likely to work.

B.1. Empirical Strategy

The extended version of the annual labor surveys between 2005 and 2012 contains the départements of birth of respondents’ parents. Although the years for which this information is available are scarce, this sample provides a unique opportunity to put the theory of vertical intergenerational transmission to a direct test. Again, I use an empirical strategy that mirrors the epidemiological approach to culture. Different from previous analyses, however, the availability of parental origins enables to focus on second-generation migrants instead of first-generation migrants: I restrict the regression sample to non-migrant married women aged 30 to 59 with at least one parent born in a metropolitan département that is different from their own département of birth.44

Focusing on second- rather than first-generation migrants improves the credibility of the identification strategy. First, a typical respondent in the regression sample has parents who were born in the 1930s. As a result, it is all the more plausible to assume that the assignment of geographical origins traces back to the interwar period. Second, because the location of second-generation migrants was determined prior to their birth, the results are unlikely to be driven by selective migration patterns. Moreover, parental origins are available for both parents. It is thus possible to assess whether the transmission of the legacy of the war occurred primarily through mothers, or through fathers. To determine the role of each parent in vertical intergenerational transmission, I neutralize the impact of one parental origin by including département of birth fixed effects for one parent. For instance, to analyze the role of mothers’ origins, I include father département of birth fixed effects and estimate the following specification:

$$\text{working}_{ijhmfrt} = \beta \text{death}_{rate_m} + \gamma_1 X'_{ij} + \gamma_2 X'_{hj} + \gamma_3 X_f + \gamma_4 \tilde{X}'_{1911,m} + \delta_r + \eta_h + \omega_f + \epsilon_{ijhmfrt},$$

where $m$ indexes individual $i$’s mother, and $f$, her father. Historical controls are assigned at the level of the départements of birth of mothers ($\tilde{X}_{1911,m}$). Husband and household charac-

44I drop respondents for whom the precise département of birth of at least one parent is unknown or not in metropolitan France. Among the 212 thousand non-migrant married women aged 30 to 59 that are in the original sample, 32 thousands have a mother for which the département of birth is unknown or not in metropolitan France, and 37 thousands have a father for which the département of birth is unknown or not in metropolitan France. In total, there are 44 thousand respondents for which the départements of birth of at least one parent is unknown or not in metropolitan France.
teristics $X_{hj}$ contain husbands’ incomes together with husbands’ age and educational attainment, an indicator for whether the household owns its housing, and the number of rooms in the home.\textsuperscript{45} To capture individuals’ social background, I include the indicator $X_f$ for whether their fathers were employed in a high status occupation. Following the epidemiological approach, specification 7 contains fixed effect $\delta_r$ for individual $i$’s département of residence (and birth)—because the sample consists of non-migrants, individuals’ départements of residence and départements of birth are identical. $\eta_t$ is a survey-year fixed effect. This specification contains father département of birth fixed effect $\omega_f$ to effectively compare women whose fathers were born in the same département. I use two-way clustering and cluster standard errors at the level of individuals’ départements of birth (and residence), and at the level of their mothers’ départements of birth.

\textbf{B.2. Results}

I report the results in Table 4. In column (1), the coefficient of interest is identified off variations in the working behavior of second-generation migrant married women in the same cohort, born and residing in the same département, with fathers born in the same département, but whose mothers were born in départements exposed to varying levels of military death rates. The estimate is significant at the 1% level and implies that women whose mothers were born in départements exposed to high military death rates (20%) rather than to low military death rates (10%) were 13 percentage points more likely to be working. Adding husband and household controls barely changes this estimate. Because the marriage market has a role in the transmission of the legacy of the war, I further add in column (3) mother in-law and father in-law département of birth fixed effects. This allows to effectively compare women whose fathers and parents in-law have identical origins, and thereby isolate the role of mothers’ origins even more. Again, the coefficient barely changes.

In columns (4) to (6), I replicate the exercise with fathers’ origins. I find that fathers matter for the transmission of the legacy of the war, but to a smaller extent than mothers do: the estimate in column (4) implies that women whose fathers were born in départements exposed to high military death rates (20%) rather than to low military death rates (10%) were 8 percentage points more likely to be working. However, including husband and household characteristics as well as parents in-law département of birth fixed effects in columns (5) and (6) decreases the estimate and its significance. This suggests a prominent role of mothers relative to fathers in the vertical intergenerational transmission of the legacy of the war.\textsuperscript{46}

\textsuperscript{45}Unlike the censuses, the labor surveys do not contain information on housing quality.\textsuperscript{46}The coefficients in Table 4 are larger in magnitude than those found when using first-generation migrants in section III. This is probably because specification 7 does not suffer from the attenuation bias resulting
Table 4: Estimates of Working on Parents’ Military Death Rates
Sample: Second-Generation Migrant Married Women, Aged 30 to 59, Husbands Present

<table>
<thead>
<tr>
<th></th>
<th>Mother</th>
<th>Father</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Parent’s death rate</td>
<td>1.32***</td>
<td>1.37***</td>
</tr>
<tr>
<td></td>
<td>[0.44]</td>
<td>[0.42]</td>
</tr>
<tr>
<td>Wife controls</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Birth and residence départements FE</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Husband and household controls</td>
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<td>Yes</td>
</tr>
<tr>
<td>Parental controls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Father high social class</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Mother pre-war controls</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Mother birth départements FE</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Father pre-war controls</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Father birth départements FE</td>
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<td>Yes</td>
</tr>
<tr>
<td>Mother in-law birth départements FE</td>
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<td>No</td>
</tr>
<tr>
<td>Father in-law birth départements FE</td>
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<td>No</td>
</tr>
<tr>
<td>Clusters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birth-residence départements</td>
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<td>92</td>
</tr>
<tr>
<td>Mother’s départements of birth</td>
<td>92</td>
<td>92</td>
</tr>
<tr>
<td>Father’s départements of birth</td>
<td>92</td>
<td>92</td>
</tr>
<tr>
<td>Mean</td>
<td>0.83</td>
<td>0.83</td>
</tr>
</tbody>
</table>

Table 4 notes: This table reports the OLS coefficients from estimating specification 7. All the regressions contain survey-year indicators as well as an indicator for whether both parents were born in the same département. Standard errors are clustered at the level of the individuals’ départements of birth and at the level of their mothers’ or fathers’ départements of birth. The sample consists of non-migrant married women aged 30 to 59 with a husband present in the household, with at least one parent born in another département. The estimates are computed using the sample weights provided in the labor surveys. See appendix C for details about variables sources and definitions.

*** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level

from the inaccurate attribution of military death rates when using first-generation migrants.
The results are similar when using Labor force participant as the outcome (see Appendix Table B.5). Augmenting the specification with the potentially endogenous education and fertility controls does not alter the results (see Appendix Table B.6). I also show in Appendix Tables B.7 and B.8 that mothers in-law matter to some extent, although the evidence is less clear.\textsuperscript{47,48}

C. Oblique Intergenerational Transmission

The third mechanism of historical persistence I explore is oblique intergenerational transmission: whether internal migrants had a role in the diffusion of the legacy of the missing men. Given that individuals form their preferences and beliefs about gender roles when growing up upon observing their peers (Olivetti et al. 2017), I analyze the impact of the presence of immigrants on the working behavior of non-migrants. I construct for each census and each département an immigrant norm in military death rates at the département level, which is defined as the average military death rate among immigrants in a département.\textsuperscript{49} Because women are more likely to use other working women as role models when growing up, I use female immigrants of working age to compute the immigrant norm, and assign the norm of the preceding census.\textsuperscript{50} The regression sample consists of non-migrant married women aged 30 to 49 with a husband present in the household. I estimate the following specification:

\[
\text{working}_{ijhrt} = \beta \text{death rate}_{r,t-1}^{\text{norm}} + \gamma_1 X_i' + \gamma_2 X_h' + \gamma_2 \tilde{X}_{1911,r,t-1}^{\text{norm}} + \gamma_3 \text{shimi}_{r,t-1} + \varepsilon_{ijhrt},
\]  

\text{(8)}

where \(\tilde{X}_{1911,r,t-1}^{\text{norm}}\) is a vector of pre-war characteristics calculated in the same way as the immigrant norm in military death rates \(\text{death rate}_{r,t-1}^{\text{norm}}\). I also control for the share of

\textsuperscript{47}This result is somewhat different than Fernández et al.’s (2004), as they find that mothers in-law, rather than own mothers, matter in the transmission of the impact of WWII mobilization rates on female labor participation in the U.S.

\textsuperscript{48}Gouging the magnitude of vertical intergenerational transmission for the historical persistence of the war is difficult. For instance, this cannot be done in the sample of second-generation migrants as the identifying variation comes from parental origins only. One possibility is to replicate the baseline estimates from section III with the sample from the restricted version of the labor surveys, then add mothers’ département of birth fixed effects to neutralize the vertical intergenerational transmission channel occurring through mothers. Re-estimating the baseline specification generates a coefficient of 0.48, which is significant at the 5% level (s.e. of 0.22). Adding mothers’ département of birth decreases the coefficient to 0.15, suggesting that mothers’ origins play a crucial role in the persistence of the legacy of the war.

\textsuperscript{49}This methodology is similar to Daudin, Franck and Rapoport’s (2016), who study the diffusion of a low fertility norm in France in the nineteenth century.

\textsuperscript{50}As a result, the census of 1962 is not in the analysis. For the censuses of 2006 to 2012, I use the immigrant norm of 1999.
immigrants in a département in the previous census, $sh_{im,r,t-1}$. I cluster standard errors at the level of individuals’ départements of residence. As a result, each regression contains 92 clusters.

I report the results in Figure 8.\(^{51}\) I also report the results when assigning the immigrant norm of two censuses before—in this case, the regression sample contains the censuses of 1975 to 2012. The estimates imply that women residing in départements in which the immigrant military death rate norm was one percentage point higher in the preceding census were 2 to 3 percentage points more likely to be working between 1968 and 2012. The estimates are broadly similar when assigning the immigrant norms of two censuses before. Moreover, the estimates are similar when using the Labor force participant outcome (see Appendix Figure A.10). These results suggest that internal migrants also had a role in the persistence of the legacy of the war.

Figure 8: Estimates of Working on Immigrants’ Military Death Rates Norm
Sample: Non-Migrant Married Women Aged 30 to 49, Husbands Present
Censuses: 1968–2012

Figure 8 notes: This figure reports the OLS coefficients from estimating specification 8. Standard errors are clustered at the level of individuals’ départements of residence. The sample consists of non-migrant women aged 30 to 49 with a husband present in the household. The estimates are computed using the sample weights provided in the censuses. See Figure 4 notes for more details.

• significant at the 1 percent level. ▲ significant at the 5 percent level. ■ significant at the 10 percent level.

\(^{51}\)The full set of results in table form is available in Appendix 2.
V. Norms of Behavior and Cultural Beliefs

I showed in section IV that horizontal transmission through the marriage market, vertical intergenerational transmission, and oblique intergenerational transmission all concurred in the historical persistence of the legacy of the missing men. The strongest channel of persistence was the vertical intergenerational transmission channel from mothers to daughters. In this section, I explore through 2SLS whether changes in norms in the working behavior of mothers induced by WWI military fatalities when their daughters were growing up were at the roots of this historical persistence (section A). I then explore directly whether WWI military fatalities altered cultural beliefs about gender roles (section B).

A. Vertical Intergenerational Transmission of Norms of Behavior

Using the extended version of the labor surveys between 2005 and 2012, I first analyze the impact of WWI military fatalities on mothers’ working behavior when their daughters were growing up—the first-stage. I use the sample of second-generation internal migrant married women aged 30 to 59, and estimate a specification similar to specification 3:\(^{52}\)

\[
\text{worked}_{\text{irmt}} = \beta \text{death rate}_m + \gamma_1 X_i' + \gamma_2 X'_{hj} + \gamma_3 \tilde{X}'_{1911,m} + \delta_r + \eta_t + \epsilon_{irmt},
\]

where \( \text{worked}_{\text{irmt}} \) is an indicator for whether individual \( i \)’s mother was working when \( i \) was growing up.\(^{53}\) Military death rates \( \text{death rate}_m \) and the vector of pre-war controls \( \tilde{X}_{1911,m} \) are assigned at the level of mothers’ départements of birth. \( \delta_r \) is a département of residence (and birth) fixed effect, and \( \eta_t \) a survey-year fixed effect. I use two-way clustering and cluster standard errors at the level of individuals’ départements of residence (and birth), and at the level of their mothers’ départements of birth.

I report the results in column (1) of panel A of Table 5. The estimate implies that mothers born in départements exposed to high military death rates (20\%) rather than to low military death rates (10\%) were 16 percentage points more likely to have been working when their daughters were growing up.\(^{54}\) Because fathers and parents in-law also matter

\(^{52}\)Because I am only taking mothers’ origins into account, I restrict the sample to non-migrant women whose mothers were born in a different département than their own département of birth.

\(^{53}\)In the labor surveys, the relevant variable is \( \text{OPROFM} \), which corresponds to the following question: “What was your mother’s occupation? Indicate the mother’s occupation at the time when the respondent completed her education.”

\(^{54}\)This corresponds to 28\% of the mean—in the sample, 56\% of daughters report having a working mother when growing up, which is the female labor participation rate in the mid-1970s. Given that women in the sample were born between the 1960s and the 1980s, their mothers were most likely born between the 1930s and the 1950s—the labor surveys do not report parents’ ages, but the average age of childbearing was 27.
in the transmission of the legacy of the war, I include fixed effects for the départements of birth of fathers, as well as for those of parents in-law. This allows to effectively compare women whose fathers and parents in-law were born in the same départements, and thereby to neutralize the influence of their origins. The estimate in column (2) slightly increases, but is of the same order of magnitude as the one in column (1). Both estimates are significant at the 1% level, but the F statistics adjusted for two-way clustering are relatively small—between 8 and 12 (Kleibergen and Paap 2006).

I then estimate through 2SLS the impact of changes in mothers’ working behavior induced by WWI military fatalities on their daughters’ working behavior. More precisely, I estimate the following specification, where worked\textsubscript{mother}\textsubscript{irmt} is instrumented by death\textsubscript{rate}\textsubscript{m}:

\begin{equation}
\text{working}_{irmt} = \beta \text{worked}_{irmt} + \gamma_1 X'_{i} + \gamma_2 X'_{hj} + \gamma_3 \tilde{X}'_{1911,m} + \delta r + \eta t + \varepsilon_{irmt}. \tag{10}
\end{equation}

The reduced form—the impact of the military death rates of mothers’ départements of birth on their daughters’ working behavior—corresponds approximately to the estimates in columns (2) and (3) of Table 4. Because the sample used in Table 4 was slightly different—it also included non-migrant women whose mothers were not migrants but whose fathers were—, I re-estimate the reduced form on the sample of specifications 9 and 10, and report the results in panel B of Table 5. They are similar to those in Table 4, albeit slightly smaller.

The second-stage estimates are reported in panel C. When controlling for fathers and parents in-law départements of birth in column (6), the estimate implies that changes in norms of behavior induced by the war had a pass-through of about 60% from mothers to daughter. This suggests a crucial role of changes in the working behavior of one generation in passing the legacy of the war to the next generation. The estimates are similar when using the Labor force participant outcome (see Appendix Table B.9).

B. Changes in Cultural Beliefs Toward Gender Roles

In this section, I directly assess the impact of WWI military fatalities on cultural beliefs toward gender roles. I use the first wave of the French component of the Generation and Gender Survey (GSS), the ERFI dataset (Study of Family and Intergenerational Relationships), in the 1970s (Daguet 2002). As a result, these mothers would have been mostly present in the censuses of 1962, 1968, and 1975. For these censuses, I found in section III a magnitude for the legacy of the war of 15% to 10% of the mean. One possibility to explain this discrepancy is that women over-report having a working mother in the labor surveys: the labor surveys ask for the occupation of respondents’ mothers at the time they completed their education. However, it may well be the case that respondents answered instead whether they had a mother that had been working at some point in time because of imperfect recall. This would result in larger estimates.
Table 5: Estimates of Working on Mother Worked  
Sample: Second-Generation Married Women Aged 30 to 59, Husbands Present  

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>Mother worked</th>
<th>Working</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A. First-Stage</td>
<td>B. Reduced Form</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Mother’s death rate</td>
<td>1.59***</td>
<td>1.91***</td>
</tr>
<tr>
<td></td>
<td>[0.56]</td>
<td>[0.58]</td>
</tr>
<tr>
<td>Mother worked</td>
<td>0.86**</td>
<td>0.57**</td>
</tr>
<tr>
<td></td>
<td>[0.38]</td>
<td>[0.26]</td>
</tr>
<tr>
<td>Wife, husband, and household controls</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Birth-residence département FE</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Parental controls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother pre-war controls</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Father high social class</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Father birth département FE</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Mother in-law birth département FE</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Father in-law birth département FE</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Clusters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birth-residence département</td>
<td>92</td>
<td>92</td>
</tr>
<tr>
<td>Mother’s département of birth</td>
<td>92</td>
<td>92</td>
</tr>
<tr>
<td>Observations</td>
<td>17,298</td>
<td>17,298</td>
</tr>
<tr>
<td>Outcome mean</td>
<td>0.56</td>
<td>0.56</td>
</tr>
<tr>
<td>Cragg-Donald Wald F</td>
<td>40.68</td>
<td>52.94</td>
</tr>
<tr>
<td>Kleibergen-Paap Wald rk F</td>
<td>8.18</td>
<td>11.36</td>
</tr>
</tbody>
</table>

Table 5 notes: This table presents the results from estimating equation 7 across various specifications. Standard errors are clustered at the level of the respondents’ départements of birth and at the level of their mothers’ départements of birth. The sample consists of second-generation married women aged 30 to 59 with a husband present in the household. The estimates are computed using the sample weights provided in the censuses. See appendix C for details about variables sources and definitions.  
*** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level
which was conducted in 2005.\textsuperscript{55} It contains a nationally representative sample of 10,079 individuals aged 18 to 79. Among all the datasets that contain information on cultural beliefs for France, the ERFI is the only one that provides both respondents’ départements of birth and départements of residence, thus enabling the use of the epidemiological approach.\textsuperscript{56} Moreover, it contains information on respondents’ parents, though not their geographical origins.

I restrict the regression sample to French individuals that are in a couple, with a partner present in the household. Because I study cultural beliefs rather than working behavior, I do not put restrictions on age nor on sex in the sample selection. As before, I focus on internal migrants born in metropolitan France, and drop those born or residing in the three départements that did not belong to France before WWI. I also drop respondents who did not grow up with their mothers and fathers. The regression sample contains 1,797 observations, with 1,007 women and 790 men (see Appendix 2 for summary statistics).

The survey contains three questions directly related to cultural beliefs about the role of women in the labor force. Respondents were proposed various statements and asked whether they “agree”, “somewhat agree”, “do not agree nor disagree”, “somewhat disagree”, or “disagree” with them. I assign a value of 0 to “agree”, and a value of 1 to “disagree”, and I use 0.25 point-increments for the responses in between. As a result, a higher value indicates more progressive views toward gender roles. I report in Table 6 the average responses for men and women separately. About three-quarter of respondents somewhat disagree with the statements. There is no notable difference between men and women in their attitudes.

I then aggregate these statements in a three-point scale index. For ease of interpretation, I standardize this aggregate on a one-point scale.

As before, I use the epidemiological approach to assess the legacy of the missing men on cultural beliefs. I estimate the following specification separately for each sex:

\begin{equation}
values_{ijhbr} = \beta \text{death}_b + \gamma_1 X_i' + \gamma_2 X_{jh}' + \gamma_3 \hat{X}_{1911,b} + \delta_r + \varepsilon_{ijhbr},
\end{equation}

where $values_{ijhbr}$ is the aggregate on a one-point scale for individual $i$ with partner $j$ in household $h$, born in département $b$, and residing in département $r$. $X_i$ contains a set of year of birth indicators. $X_{jh}$ contains the following set of partner and household controls: an indicator for whether the respondent’s housing is a house rather than an apartment.

\textsuperscript{55}ERFI stands for \textit{Étude des relations familiales et intergénérationnelles}. It was conducted by the INSEE and the INED. See Régnier-Loilier (2016) for a comprehensive presentation of this survey.

\textsuperscript{56}The two main other datasets with information on cultural beliefs are the opinion barometer of the DRESS (2000–2013) and the French component of the International Social Survey Program (ISSP). However, they do not contain respondents’ départements of birth.
Table 6: Distribution of Cultural Beliefs Toward Gender Roles in the ERFI (2005)

Interpretation: Higher Values Indicate Disagreement with the Statement

<table>
<thead>
<tr>
<th>Statement</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  If a woman earns more than her partner, it is bad for their relationship</td>
<td>0.80</td>
<td>0.78</td>
</tr>
<tr>
<td></td>
<td>(0.27)</td>
<td>(0.30)</td>
</tr>
<tr>
<td>2  Women shouldn’t be able to decide how to spend the money they earned without asking their partners</td>
<td>0.69</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>(0.35)</td>
<td>(0.34)</td>
</tr>
<tr>
<td>3  In an economic crisis, men should keep their jobs in priority</td>
<td>0.70</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>(0.35)</td>
<td>(0.35)</td>
</tr>
<tr>
<td>Cultural values index (three-point scale)</td>
<td>2.20</td>
<td>2.28</td>
</tr>
<tr>
<td></td>
<td>(0.64)</td>
<td>(0.64)</td>
</tr>
<tr>
<td>Cultural values index (one-point scale)</td>
<td>0.73</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>(0.21)</td>
<td>(0.21)</td>
</tr>
</tbody>
</table>

Observations 790 1,007

Table 6 notes: This table presents summary statistics for the cultural beliefs variable in the ERFI dataset. Disagreement with the statement implies higher values. Standard deviations are in parenthesis. The sample consists of French individuals born in metropolitan France that are internal migrants. See appendix C for details about variables sources and definitions.

the number of rooms in the housing, an indicator for whether the respondent owns her housing, the age of her partner, indicators for her partner’s educational attainment, and her partner’s monthly (log) income. The set of historical controls $X_{1911,b}$ are assigned at the level of respondents’ départements of birth. Consistent with the epidemiological approach, this specification includes a département of residence fixed effect, $\delta_r$. I use two-way clustering and cluster standard errors at the level of individuals’ départements of birth and départements of residence.

I report the results for the female sample in Table 7. The coefficient of interest $\beta$ is identified off variations in the values held by women of the same cohort, residing in the same département, but born in départements exposed to varying levels of military death rates. The estimate in column (1) implies that women born in départements exposed to high military death rates (20%) rather than to low military death rates (10%) hold more progressive cultural beliefs as the aggregate is 15 percentage points higher in this case. This
corresponds to about 20% of mean beliefs. Adding partner and household controls in column (2) does not alter the results. Adding an indicator for whether the respondent is working and controlling for her educational attainment and fertility in column (3) again barely changes the estimate. This suggests that the legacy of the missing men on women’s cultural beliefs is not mediated by their education, fertility, and labor choices. Nevertheless, working women are more likely to hold progressive cultural beliefs as working is associated with the aggregate being 4 percentage points higher.

I also include parental controls. First, I augment the baseline specification of column (2) with an indicator for whether the respondent’s mother was working when she was aged 15 in column (4). The coefficient of interest decreases from 1.45 to 1.07, suggesting that about one quarter of the impact of the WWI military fatalities on women’s cultural beliefs was transmitted through their mothers’ working behavior. Additionally, women whose mothers were working are also more likely to hold progressive cultural beliefs. Controlling social background—father social class—and mothers and fathers’ educational attainment in column (5) does not change the results, nor does controlling for respondents’ working behavior in column (6). I replicate the analysis for men in Appendix Table B.10 and find no impact of the war on their cultural beliefs.

VI. Conclusion

Did the upward shift in female labor participation generated by WWI military fatalities perpetuated across generations? I find that one century after WWI, the legacy of the missing men is still vivid. Comparing women living under the same institutional conditions but born in départements that were differentially exposed to military death rates, I find evidence for a persistent impact of WWI military fatalities on women’s working behavior at the individual level, independent of the legacy of the war on local institutional structures. I uncover three mechanisms underlying this historical persistence: horizontal transmission through the marriage market, vertical intergenerational transmission, and oblique intergenerational transmission. The strongest channel consists in the vertical intergenerational transmission from mothers to daughters. In fact, changes in the working behavior of mothers induced by the war passed through the working behavior of their daughters at a very high rate. Finally, I find that WWI military fatalities not only affected women’s working behavior but also their beliefs about gender roles.
### Table 7: Estimates of Cultural Beliefs on Military Death Rates

Sample: Migrant Women, Partners Present  
ERFI: 2005

<table>
<thead>
<tr>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death rate</td>
<td>1.47***</td>
<td>1.45***</td>
<td>1.55***</td>
<td>1.07***</td>
<td>1.05***</td>
</tr>
<tr>
<td></td>
<td>[0.42]</td>
<td>[0.37]</td>
<td>[0.40]</td>
<td>[0.39]</td>
<td>[0.40]</td>
</tr>
<tr>
<td>Working</td>
<td>0.04**</td>
<td>0.05***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[0.02]</td>
<td>[0.02]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother active</td>
<td>0.04***</td>
<td>0.04**</td>
<td>0.03**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[0.01]</td>
<td>[0.01]</td>
<td>[0.01]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residence département FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Pre-war controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cohort FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Partner and household controls</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Fertility and education</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Parental controls</td>
<td>Mother education</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Father education</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Father high social class</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Clusters</td>
<td>Residence département</td>
<td>94</td>
<td>94</td>
<td>94</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>Birth département</td>
<td>81</td>
<td>81</td>
<td>81</td>
<td>81</td>
</tr>
<tr>
<td>Observations</td>
<td>1,007</td>
<td>1,007</td>
<td>1,007</td>
<td>1,007</td>
<td>1,007</td>
</tr>
<tr>
<td>Mean beliefs</td>
<td>0.76</td>
<td>0.76</td>
<td>0.76</td>
<td>0.76</td>
<td>0.76</td>
</tr>
</tbody>
</table>

Table 7 notes: This table presents the OLS coefficients from estimating specification 11. Standard errors are clustered at the level of the individuals’ départements of birth and départements of residence. The sample consists of migrant women with a male partner present in the household. The estimates are computed using the sample weights provided in the ERFI dataset. See appendix C for details about variables sources and definitions.

*** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.
References


Huber, Michel, *La Population de la France Pendant la Guerre* 1931.


