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Below is an economic analysis of House Bill 17-1282 concerning the creation of the veterinary student loan repayment program in Colorado. There are several rural counties in Colorado that claim to be experiencing a shortage of veterinary services. Specifically, they are experiencing shortages of food-animal veterinarians(FAVs). In response to these shortages, HB17-1282 creates the Veterinary Loan Repayment Council. This Council will oversee the Loan Repayment Program and issue funds authorized through the Bill. The Council will award an eligible veterinarian with a contract to pay back a portion of their student debt.

The veterinarians must have graduated from an accredited veterinary school of medicine, currently live in Colorado or have lived here for three years at some point, and agree to practice in a rural area in which the council has determined there to be a shortage. The Council will repay student loans in the name of the veterinarian under contract. The amount of repayment is $10,000 upon completion of the first six months, an additional $15,000 upon completion of the second year, an additional $20,000 upon completion of the third year, and $25,000 upon completion of the fourth year.

The Governments presence in a market may or may not be appropriate. With respect to veterinary practices, it takes closer examination to see why intervention might be necessary. Animal care is a private good, whose price can usually be negotiated to an efficient level in the market without government intervention. If there is need for animal care the person who owns the animals will pay a certain price for a veterinarian to care for the animal. The price will be determined by the supply of care and the demand for that care. This equilibrium is reached with regards to the private costs and benefits associated with the animal care, and regardless of the public costs or benefits.

The equilibrium reached above will lead to an efficient outcome if these transactions don't produce any externalities. An externality is a cost or benefit that a market transaction imposes on persons or entities outside that market. Negative externalities stemming from lack of FAV care include the spread of infectious diseases that could diminish our food supply or threaten public health if transferred to humans. The diagnosis and treatment of such zoonotic outbreaks for the agricultural sector in Colorado underline the positive externalities arising from the FAV's market. As health care professionals, the FAVs would likely to be the first to detect disease and call attention to it.

For example, the devastating effect to Taiwan's pork industry is what can result from a lack of adequate FAV care. Between March and July in 1997, more than 4 million out of roughly 11 million hogs died from an outbreak of Foot and Mouth Disease. Chang, Hsia, and Griffith account 21.1 percent of the total value of agricultural production to the pig industry in Taiwan during this time. The failure to properly identify and treat the outbreak early lead to over 3.85 million hogs being euthanized as the disease spread from farm to farm. In a paper diagnosing the economic impacts of foot and mouth disease by Rushton and Knight-Jones, lack of investments in veterinary services, education, research and general infrastructure to develop the animal health system contributed significantly to the epidemic. This outbreak rattled the Taiwanese economy causing the Gross Domestic Product of Taiwan to fall by 0.64% or the equivalent of $US 14.3 billion. This example highlights the value that FAV care can have beyond the private level when public health and food security are among the externalities generated.

Given these externalities, a society's willingness to pay for the veterinary services is likely to exceed a rancher's willingness to pay. The public will be concerned with the detection and timely treatment to any diseases while the rancher's main concern is profit. The rancher's

private benefit of disease detection is less than the benefits to society. Therefore, the private market for FAV services is most likely to support a level of activity below the socially optimal level. The social benefit from FAV care can be felt when there is a diagnosis and treatment of infectious diseases which prevents widespread transfer to other animals and other farms. The Government can reduce the level of negative externalities by stimulating the supply of FAV care produced in the market.

Subsidizing the student loan debt is one solution that will lure new veterinarians into these underserved markets. Early career veterinarians leave school with an average of $136,320 in debt according to the American Veterinary Medical Association (AVMA) and the U.S. Department of Labor estimates the starting salary for veterinarians to be $68,302 for graduates who can find full-time work. Facing such high debt, graduates usually seek more attractive jobs in urban areas. Areas of higher per capita income and dense populations tend to favor veterinary practices because residents are better able to afford pet ownership and the associated veterinary care. This has historically led to levels of veterinary care in the rural areas that are too low to counteract the negative externalities of food animal production.

A study modeling the capacity utilization of veterinary practices in 2013 found there to be an excess capacity of veterinarians of 12% in the U.S. Another study on U.S. veterinary compensation shows that the mean salary for food exclusive veterinarians was over $143,000. That is roughly $22,000 more than a companion animal predominant veterinarian's mean salary. This indicates that even faced with considerably higher salaries, these veterinarians do not want to take these unattractive rural jobs. Recognizing this, the Bill is attempting to subsidize veterinarian compensation in rural, food animal production markets.

A Federal Veterinary Medicine Loan Repayment Program(VMLRP) was enacted in 2003 by the Secretary of Agriculture and is outlined in detail on the Department of Agriculture's website. This was attempting to remedy the problem in the exact same way that this Bill is attempting to remedy it, only at a federal level, by subsidizing veterinarian student loan payments for graduates to service the rural areas in need. There are payments of $25,000 for each year of veterinary care completed in a designated shortage area for up to three years. According to the VMLRP annual report of 2015, there were 184 designated shortage areas with only 43 of those areas being filled by the Program.

Each state can nominate a maximum number of new shortage areas within their borders each year. Colorado is allotted eight nominations per year. They had all eight officially recognized by the VMLRP in 2016 but was awarded no contracts. Colorado has been awarded 1 contract in the last 3 years according to the VMLRP's yearly reviews. With only around 50 VMLRP contracts awarded (both new and renewal) per year by Congress at the national level, the program does little to subsidize the FAV care in Colorado and, most likely, the rest of the U.S.

HB17-1282 will increase the subsidies available to the veterinarians in these rural markets. There is no restriction mentioned in the Bill to limit the number of new graduates that are able to participate each year. This is a way for the government to internalize the cost of the externalities into the market for animal care. Increasing the compensation to rural veterinarians may help attract some newly graduated veterinarians. However, if the subsidies were issued directly to the veterinarians and there was no involvement of a third party, in this case the lenders of student debt, the subsidies would be available to many more veterinarians. Not only attracting newly graduated veterinarians, but also enticing any of the 12% excess

capacity of labor observed in the 2013 study discussed above. Veterinarians who paid out of pocket for their education or out of work veterinarians who have no debt would now be eligible for subsidies. This would be more effective.

There may simply be more money needed. Colorado alone received $6.12 billion in farming subsidies from 1994 to 2003 according to the Environmental Working Group. Subsidies such as these reflect the value assigned to national food security. As seen in the Taiwan pork industry example from earlier, the negative externalities that surface when our food security is not protected properly can be vast. The Government must value these types of externalities highly and intervene in the markets to reduce such externalities.

Private incentives dictate the level of care supplied and demanded in the market. In the market for FAVs, this is inefficient because of the externalities that stem from this market. Societal needs for veterinary expertize are large and increasing, but the potential contributions of veterinarians are lacking because inadequate financial incentives drives new veterinarians to more attractive markets where the positive externalities generated are far less. The Government should increase subsidies to these shortage areas to compete for labor. HB17-1282 is an adequate way to begin to address this.

However, a more effective subsidy that would reach a much broader labor force would be a subsidy available directly to the veterinarian and available to all veterinarians willing to take these rural positions, not just new graduates. The increased subsidies along with a structural change in how the subsidies are awarded will push the market towards efficiency.

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