It is clearly enough to assume that $b_1 > 0$ and $b_2 = \ldots = b_n = 0$. Notice that $A = (a_1, \ldots, a_n)$ can be written as a convex combination of $B = (a_1 + b_1, a_2, \ldots, a_n)$ and $C = (-a_1 - b_1, a_2, \ldots, a_n)$. Therefore we have: $\exists \lambda \in \mathbf{R}, N(A) \leq \lambda N(B) + \lambda N(C) = N(B)$ (using the hypothesis). This solves the question.